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On the cover:
This hot air balloon represents the growing interest in Lighter-Than-Air flight in America. Photograph courtesy of Escott Gardiner of Kent, Washington. Mr. Gardiner is the Accident Prevention Program Manager in the Seattle Flight Standards District Office.

Photograph courtesy of NATA.

A professional maintenance technician finishes up an engine re-hang. Technicians today must not only have the skills to work on yesterday's aircraft, they must also have the skills to work on high-tech jet aircraft.

Maintenance Image

David Wadsworth, PAMA Executive Director

Image: ". . . to see ourselves as others see us."

Sometime in the early 1980's an internationally recognized daily newspaper interviewed an aircraft mechanic employed by a major U.S. airline. The content of this article has long since escaped my memory. What remains vividly in my memory is the image of this technician as he presented himself for his interview. The picture on this front page article showed an aviation maintenance technician in a T-shirt, sporting two or three days' growth of beard, and wearing a baseball cap—reversed with the bill pointing backwards. How much damage, I have often wondered, was done to the public concept of the professional aviation maintenance technician? How much public confidence in air safety was eroded by just this one unfortunate occasion?

Maintaining the appearance of professionalism is part of being professional. Look around you at other recognized professions. What would be your opinion of a doctor who greeted you wearing stained and ragged garments, using instruments selected from a cluttered benchtop of questionable cleanliness? What would you think if, on your next airline flight, the flight crew boarded the aircraft engaging in horseplay and being loud and boisterous?

Image is a concept not restricted to physical appearance alone. It is formed within the individual and is projected to those around us through words and deeds. How many times have you heard technicians use phrases such as "I'm only the mechanic...?" What does this tell you about the image being formed inside that person? What if our ragged, dirty doctor exhibits doubt about his or her importance to your well being? Scenes and attitudes like these degrade the image and confidence level of any profession.

As professionals in the aviation maintenance field we shoulder a heavy responsibility for human lives and equipment. We should be viewed as being organized, confident and completely able to carry that responsibility.

Let us be aware of the signals we are giving to the rest of the world and be sure we present the most professional image and attitude possible. We will be perceived exactly as that which we project.

(Reprinted with permission from the July/August 1991 PAMA News)

PROFESSIONAL AVIATION MAINTENANCE ASSOCIATION

by Peter Rohrbach

The subject of the preceding article by David Wadsworth, Executive Director of the Professional Aviation Maintenance Association (PAMA) is hardly surprising when PAMA's motto is "Dedicated to promoting safety, knowledge, and dignity in the aircraft maintenance profession." As you have no doubt figured out by now, PAMA is to be featured in this fourth article in the FAA AND INDUSTRY series.

PAMA, which is celebrating its 20th anniversary this year, is the only national professional association representing the aviation maintenance industry and the individual maintenance technician—those who work on our aircraft and keep them airworthy. In 1971 a group of aviation maintenance technicians gathered in Pittsburgh to form this new aviation association. They stated their aims quite clearly: They would be non-union, non-partisan, non-profit, and non-sectarian. Their only commitment would be to aviation maintenance professionals and to educate the public to view them as such, instead of as "grease monkeys," which is a derogatory term.

Today, PAMA's national headquarters is in St. Ann, MO, and the Association's day-to-day operations are conducted by an Executive Director and a staff of five people. The present Executive Director, David Wadsworth, has held that position since 1988. He is a veteran A&P technician with experience in the aviation industry, has been a PAMA member since 1977, and served three years on PAMA's Board of Directors before taking his present position.

Overseeing the Association is a Board of Directors, composed of a broad spectrum of people elected from the aviation maintenance industry. They are all volunteers who serve on the board without pay or compensation. The current president of PAMA is James Rardon, who is a professor of aviation technology at Purdue University in Indiana with 25 years of teaching experience and who also holds an A&P certificate, an IA, and a DME.

The principal means that PAMA uses to promote safety in modern aviation is through recurrent training of technicians. Federal Aviation Regulations do not require recurrent training for aviation maintenance technicians, so PAMA has stepped in to fill the need by sponsoring numerous technical seminars across the country each year. Topics includes updates, developments, and innovations in the rapidly advancing aviation, aerospace, and electronics technology used in today's sophisticated aviation system; reviews or changes in Federal Aviation Regulations concerning aviation maintenance; demonstrations or reviews of the skills needed to become an A&P mechanic.

At the local level, the individual chapters present over 150 technical seminars for aviation professionals annually. At the regional level, the association offers a number of two-day technical seminars which it calls "PAMA Forum." Aging aircraft, human resources management, maintenance techniques, Federal Aviation Regulations, safety in the workplace, and environmental considerations are only a few of the topics covered. At the national level, PAMA presents each year its annual Aviation Maintenance Symposium and Trade Show, the largest aviation maintenance event in America. This annual event features not only a trade show which exhibits the latest in aviation maintenance products and services, but also more than 50 technical seminars designed for the recurrent training of technicians. The most recent national PAMA symposium was held in Anaheim, CA this past February where over 2,000 people were in attendance, visiting 200 exhibition booths, and where FAA Administrator James Busey gave the main address at the annual banquet. The next national symposium will take place in Nashville, TN on February 25-27, 1992.

With aviation technology rapidly changing, industry analysts have estimated the need for some 50,000 new highly qualified aviation maintenance technicians by 1997. As a consequence the industry faces a mechanic shortage. PAMA steps in again, ensuring competent aircraft maintenance in the future by sponsoring young people in the profession through its scholarship program. This year PAMA will directly gather and administer over $35,000 in scholarship monies. PAMA awards these scholarships to students to help them complete their education in an aviation maintenance technician school. In addition, PAMA sponsors and attends maintenance career guidance programs in secondary schools, and it publishes career guidance materials for teachers and guidance counselors.

To recognize the necessary role of the aviation maintenance technician in safe flight, PAMA conducts a number of award programs each year, such as the Joe Chase Award (given to the individual who has shown outstanding personal efforts to improve the knowledge of aircraft technicians and inspiring others in aviation safety), the PAMA/ATP Award (given in cooperation with the Aircraft Technical Publishers to the individual member whose outstanding performance best exemplifies the PAMA motto), and other awards of merit and excellence. The Association also publishes a monthly magazine called *PAMA News*, one of the few magazines in the country devoted to aircraft maintenance.

PAMA is heavily involved with other aviation associations and with FAA—speakers from FAA regularly appear at its various symposia. Furthermore, PAMA works closely with FAA on matters which concern aviation maintenance. The Association has formed and chaired the Industry/FAA Part 65 Review Group which has been meeting for the past 18 months to review and revise FAR Part 65, "Certification: Airmen Other Than Flight Crewmembers," the regulation which affect aviation maintenance technicians. And PAMA is a member of the newly-formed Aviation Rulemaking Advisory Committee (ARAC) which FAA has formed to advise the Agency on regulatory actions.

PAMA membership has grown from 430 in 1972 to some 4,000 A&P technicians and repairmen today. It also includes some 350 company members (such as Bell Helicopter, Kellogg Co., and Xerox), firms which support this national effort to promote true professionalism in aircraft maintenance. There are also 39 local PAMA chapters from coast to coast which conduct monthly meetings in their area about aircraft maintenance and safety.

During the past four years membership in the Association has been growing about 12 to 15 percent annually, and at the national symposium last February FAA Administrator James Busey said that PAMA is "the fastest growing association in American aviation today."

And that is good news for all of us—because the more professionalism there is in aviation maintenance, the safer it will be for all of us to fly. ■

For more information on the Professional Aviation Maintenance Association or on starting a PAMA chapter in your town contact:
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EDITOR'S NOTE: Mr. Rohrbach is a freelance writer from the Washington, DC Metropolitan area. He is the Editor of PAMA News and has contributed articles to FAA Aviation News for many years.

Photograph by Dean Chamberlain.

Hot air balloons come in all shapes and colors. These balloonists are enjoying an early morning flight over Maryland.

Give New Meaning to Slow Flight

by Dean Chamberlain
Associate Editor

Normally, if you tell someone they are full of hot air they might hit you. But for some aviators, hot air is a passion. They fly hot air balloons.

Part of the world of lighter-than-air (LTA) flight, free balloons (both gas and hot air) and airships make up the two classes of LTA aircraft seen today. Looking back in history, today's LTA aircraft can trace their aviation heritage to a hot air balloon launch in September 1783 that carried the world's first three passengers aloft. Historians did not record if the history-making crewmembers, a sheep, a duck, and a rooster, enjoyed their flight.

From that humble start in 1783, hot air balloons evolved into the airships of LTA's "Golden Age" of flight following War World I. During the period between the world wars, giant airships flew the world as the transportation method of choice for some of the world's wealthy.

Many say the end of LTA's "Golden Age" was highlighted by the spectacular fire of the German zeppelin, *Hindenburg*, on a May night in Lakehurst, NJ in 1937 in which 36 people died. Although the fire demonstrated the dangers of using hydrogen gas for lift, the fate of the giant airships was really sealed by the development of the first profitable fixed-wing passenger transports during the 1930's. Airplane speed beat airship luxury in the race for passengers.

Surprisingly, more than a half-century after the *Hindenburg* fire, LTA aircraft still play an important role in aviation. Today their most visible role is as flying billboards using safe, helium-filled blimps and hot air balloons to promote products from tires, to film, to real estate. Another important role is the growing sport and business of flying hot air balloons. Based upon the latest FAA information (1989) there are 5,826 hot air balloons and 29 airships registered in United States.

The number of LTA craft and their flight activities increases the possibility that more and more pilots of other types of aircraft may encounter either a balloon or blimp in flight.

The following information provided by two LTA pilots, one a commercial hot air balloonist, the other a Goodyear blimp pilot, provide an interesting insight into the world of LTA flight. They also discuss some of the unique needs and safety problems of the two classes of LTA aircraft.

BALLOONS

As discussed in the May-June issue of *FAA Aviation News'* "FamousFlight" feature on hot air balloons, the modern hot air balloon is a rather recent invention only dating back to the 1960's. Today's hot air balloons face risks never thought of in the 1700's. There are still angry farmers, but today's balloonists face potentially deadly high powerlines, TV and radio antennas, tall buildings, housing developments, TCA's and restricted airspace, as well as other aircraft. The quiet world of ballooning has never been quite the same for balloonists since that first Wright Brothers' powered flight in 1903.

For airmen accustomed to powered, pilot-controlled flight, travelling at the speed of the wind offers a unique experience for both hot air balloonists and their passengers. Like all things though, too much of a good thing, in this case wind, can be bad for a balloonist. Balloonists normally fly very early or late in the day when the surface wind is lighter, minimizing the risk when launching or landing a balloon. During these times there is less danger from thermals, windshear, and the ever-present summer's mid-day thunderstorm.

A balloon's total dependency on the wind, both for speed and direction, is why FAR § 91.113 gives balloons right-of-way over every other category of aircraft. The same rule also requires the other class of LTA aircraft, airships, to yield to both balloons and gliders. (Airships do have the right of way in most other cases over an airplane or rotorcraft.)

An important difference between hot air balloons and other types of aircraft that non-balloon pilots need to be aware of is a balloon's inability to respond quickly to desired changes in altitude. Using only one or more propane-fueled burners attached to the top of the balloon's passenger basket as a source for heat, hot air balloonists add heat to their balloons to increase altitude or vent heat to descend. Neither procedure takes place quickly. According to Michael Gerred, from Bel Air, MD, who operates Light Flight Hot Air Balloons, a balloon pilot must be able to judge both the amount of heat needed and the amount of delay there is between adding heat to a balloon and the resulting increase in lift. The process of adding or dumping heat and waiting for the desired change in altitude is what gives balloons their characteristic up and down motion while flying or landing. In a sense, one can think of a balloon changing altitude like someone climbing or descending a series of altitude "steps." Step, check results, step again. The more experienced the pilot, the smoother his or her balloon climbs or descends the steps.

A balloon's inherent delay in starting to change altitude and its dependence on the wind for both speed and direction are the reasons other aircraft must give way. Although the FAR require it, common sense says if there is ever a chance of a collision between a balloon and another category or class of aircraft, the non-balloon pilot had better take evasive action. The other aircraft pilot can not expect a nonsteerable balloon to get out of the way quickly. Having said that, although a balloon cannot quickly start to move out of another aircraft's way, once a balloon starts moving it can gain altitude very quickly. That ability to quickly gain altitude is why there is always the danger of a mid-air collision if the other aircraft pilot tries to climb over an ascending balloon. A small aircraft may not be able to climb over an ascending balloon. Some balloons, once they start climbing, can climb at a rate of up to about 1,200 feet per minute. Gerred also said once a large balloon, say one with a mass of about three tons of air in its envelope, starts climbing, it does not stop very quickly. Combine that balloon's climb rate and mass with its lack of visibility overhead, add one small, low-wing, aircraft's minimal climb rate and its pilot's lack of vision below its wings, and the potential exists for an airplane-balloon mid-air collision. The safe option for the airplane pilot is to give way around the balloon, not over the balloon.

A balloon pilot's lack of vision overhead is why when two balloons are close together, the lower balloon has right of way. The lower balloon pilot may not be able to see the upper balloon. And the danger of a vertical collision between two balloons is as critical as a collision between a balloon and another category of aircraft. In some cases, a collision between a lower balloon's envelope and the upper balloon's basket can result in the lower balloon dumping or venting its hot air. This unplanned loss of lift at altitude can result in an accident. Fortunately when two balloons collide horizontally, envelope to envelope, their slow closure rate and design normally prevent significant damage to either balloon.

Photograph by Dean Chamberlain.

Michael Gerred of Light Flight Hot Air Balloons discusses ballooning during a precision "bombing" flight.

Although balloons are wind dependent, experienced balloon pilots are very good at "flying" their balloons by being able to "read" the wind and taking advantage of its changing direction. They "control" their balloons by adjusting their altitude to take advantage of any wind flow in the direction they want to fly. This ability to "fly" the wind is why one of the prerequisites for being a good balloon pilot is understanding weather and knowing how to get a good weather briefing. Winds aloft reports are as important as surface winds and forecasts. One way pilots verify current winds-aloft weather information is by releasing and tracking helium-filled toy balloons. By watching the small balloons weave their way through the various levels of wind at altitude, pilots can visualize their course and required altitude before takeoff.

A balloon pilot's ability to judge the wind's speed and direction is often tested at balloon meets where prizes are awarded for their navigational skills, ability to follow another balloon, and ability to fly to a designated target and "bomb" it with a marker. Additional flying skill and experience normally is a prerequisite for pilots competing in balloon events at meets. According to one race organizer, Jetta Schantz of Skysigns Unlimited, Jacksonville, FL, many racing event sponsors require more than the FAA minimum commercial pilot requirements for competing pilots. The added pilot experience requirement provides for a safer race program and makes the races more competitive. Today, partly because of the commercial advertising opportunities a race offers and the prize money available, there are a number of regular races staged at meets across the country. In addition to races and the commercial use of balloons, like their airplane counterparts, balloonists hold many hot air balloon events and festivals throughout the summer months around the country to share their love of the growing sport of hot air ballooning.

During a recent flight at one race, Gerred talked about ballooning and its popularity. When asked what special information other types of aircraft pilots should know about ballooning, he said there were several things he thought were important. First he asks all aircraft pilots to avoid the urge to make a "gun" run on a balloon, even if balloons do make a large, interesting, and slow-moving target. As an airplane pilot himself, he said, "I understand the urge, but please don't." He also compared balloons to VOR's. They both attract airplanes. He said, pilots flying near a balloon should watch out for other aircraft converging around the balloon, like they watch out for other aircraft converging around a VOR. Also when flying near a balloon, airplane pilots need to be aware that balloon pilots frequently fly low to the ground to take advantage of orographic winds around and through various terrain features. The danger is if the airplane pilot is following the balloon and not paying attention, he or she could fly into the ground or possibly violate the FAR regarding minimum safe altitude. He said one way pilots can avoid such problems is by calling balloonists on VHF 123.3 or 123.5. Many balloonists monitor one of these two radio

frequencies. Aircraft flying near a balloon can call on one of the frequencies and check on the intended flight of the balloon. Through coordinating their flight activities, both pilots can ensure their own safety. Finally, like the following information about blimp pilots, Gerred said balloon pilots have no objection if other pilots want to fly by and take a look at the balloon. He only asks each pilot to remember many balloon flights are commercial activities with passengers who paid to enjoy the romance, serenity, and quiet a balloon flight offers. Please fly by, look, and fly on, and allow the paying passengers to enjoy the quiet flight only a balloon can offer.

AIRSHIPS

From travelling with the wind in the oldest form of LTA aircraft, a hot air balloon, the newest Goodyear blimp, the *Spirit of Akron*, represents the latest evolution in the other class of LTA flight, the airship. Recently, the Pompano Beach, FL-based airship was at Glenn Martin State Airport in Baltimore, MD, during May as part of its annual six-month tour of America. During one flight, Drew Marshall, one of the *Spirit's* five pilots, talked about the blimp, including comments about other pilots wanting to see the blimp in flight.

The blimp's size makes it both unique and of interest to other pilots. If you wonder how big it is, it is like asking, "How big is big." It is b-i-g! The *Spirit* measures 205.5 feet long, 62.2 feet high, and 47 feet wide. It is longer than a Boeing 737 and almost as long as a Boeing 747. (A Boeing 747 is 231 feet 10 inches long, 63 feet 5 inches high, and has a cabin width of about 20 feet wide.) When you compare the blimp to a typical general aviation aircraft, such as a Cessna 152's length of 24 feet 1 inch, height of 8 feet 6 inches, and 33-feet-4-inch wingspan, the blimp is huge. It depends upon 247,800 cubic feet of helium for its lift. Although the blimp is big, it is not fast. The much smaller C-152 flies faster. The *Spirit* normally cruises at 40 MPH with a maximum airspeed of 65 MPH.

Size and speed are only two of the obvious differences between the large airship and general aviation aircraft. Flying a blimp is also different. Marshall said it takes a while for a pilot to transition from flying an airplane to flying an airship. He said his Goodyear training and eventual FAA checkride totalled about 250 hours of flight time. (Aspiring blimp pilots note: Goodyear requires a minimum of 1,000 flight hours and a commercial pilot license with instrument rating before the company will consider someone as a possible replacement pilot.)

Marshall, an airplane pilot with extensive experience, said learning to fly the blimp was like learning to fly all over again. Although the new fly-by-wire blimp is IFR equipped and has state-of-the-art electronic instrument, including three CRT video displays, new blimp pilots must relearn how to fly by the "seat of their pants." They must learn how to "feel" the effects of wind and air currents on the giant ships. Blimps are so long that the nose and tail may be in different air currents at the same time, and their slow speed keeps them in the air currents for a longer period of time. A blimp pilot must be able to sense what the airship is doing and be able to anticipate what has to be done to control it.

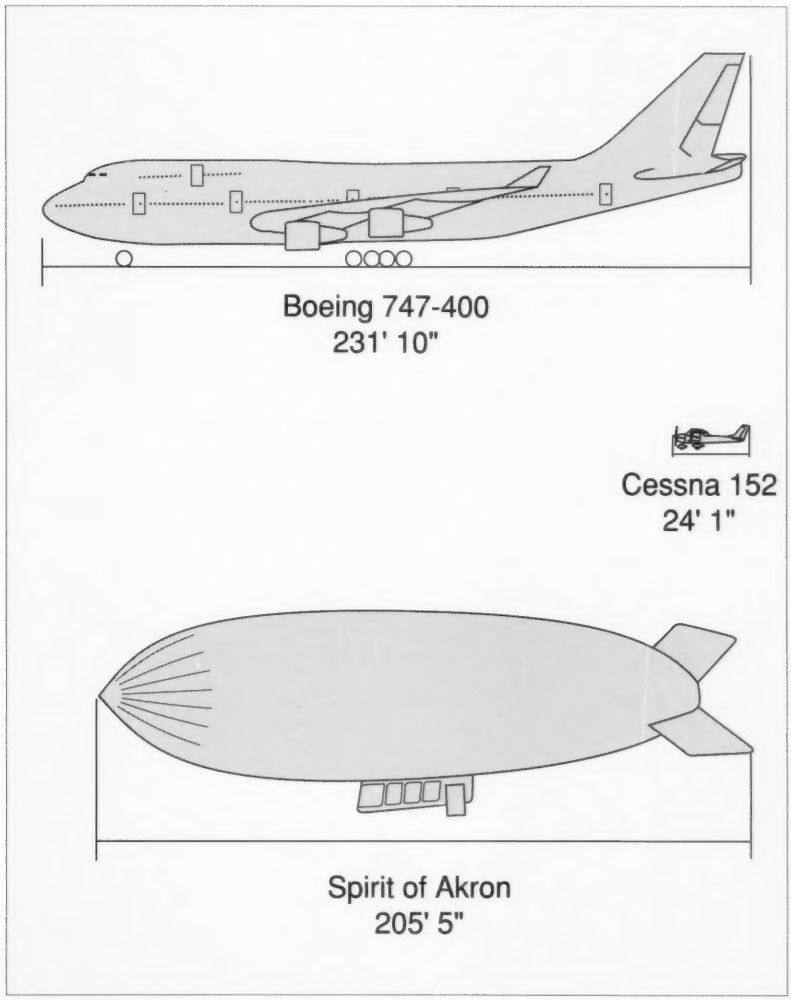
To get an idea of what is involved in flying a blimp, visualize flying one for a moment. First, put yourself in the pilot's seat with its greenhouse view of the world. Now imagine controlling a 205-foot-long, 62.2-foot-tall, rubber-coated polyester tube full of helium floating through the air. Pretty easy, right? Now imagine trying to hold altitude in that same helium-filled tube on a hot, 90-plus degree summer day over a large, say 90,000+ seat, concrete stadium surrounded by acres of blacktop-surfaced parking lots. As you circle the stadium in a 10-knot headwind, the wind and the blimp's slow airspeed combine at times to hold you in the convective air currents over the site like a fly crawling through honey. You know what it would feel like if you were in an airplane. How easily could *you* hold altitude and heading in the *Spirit*?

By now, you should have a feel for some of the unique problems of flying blimps and their safety needs. Why? Because blimps are to pilots, what flames are to moths. Both can attract. Both can be fatal for the unwary.

We do not want to discourage people from taking an air-to-air look at this distinctive flying machine. Airship pilots certainly enjoy the camaraderie, but we need to re-

Continued on inside back cover

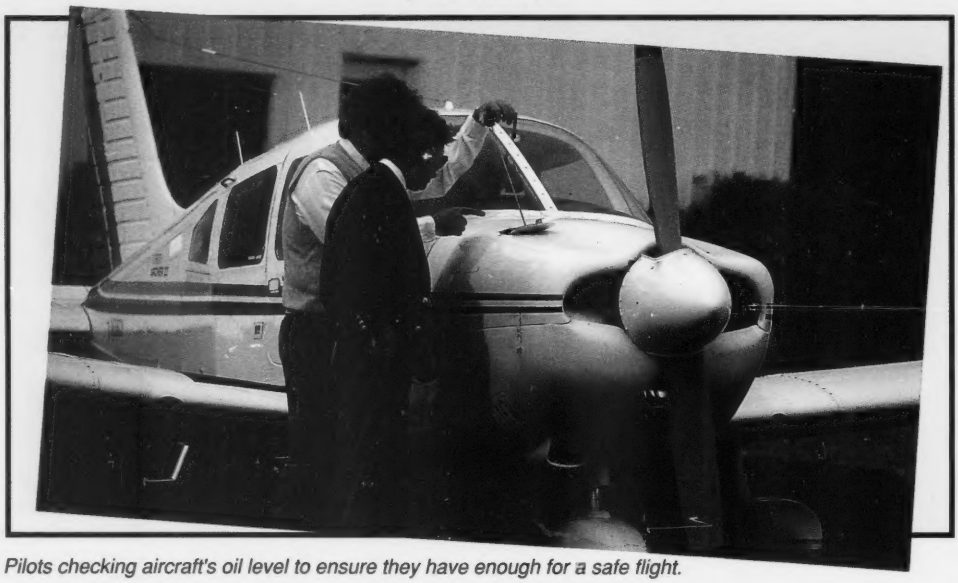
Figure 1.



FIRST CHECK FOR SAFETY
THE PREFLIGHT INSPECTION

"Safe flying really begins on the ground."

by Peter Rohrbach



Photograph courtesy of NATA.

Pilots checking aircraft's oil level to ensure they have enough for a safe flight.

FAA's *Flight Training Handbook* (Advisory Circular 61-21A), which most of us read many years ago, contains that simple statement. Its message, however, is timeless—namely, that a good preflight inspection by a pilot is the first and indispensable step towards a safe flight.

The only investment the pilot makes in an efficient preflight is a few concentrated minutes of time, but the rewards are enormous in considering the alternative. Consider this case of a pilot who did not make a thorough preflight and then paid a price.

The pilot had planned a flight in a Cessna 177 *Cardinal* from an airport on the east coast of Florida. Because the day was clear and beautiful, the pilot and his three passengers were eager to enjoy it, and the pilot took to the air as quickly as he could. However, not long into the flight the engine began to lose power steadily, and soon the pilot found himself without power and over the water. To his credit he put the Cessna down smoothly and evenly into shallow water without a hard impact. The four people on board were uninjured, were able to exit the aircraft, and waded to the beach.

The Cessna had come to rest practically undamaged, and it was later easily moved to land and dried out. The fact that the aircraft was intact and relatively undamaged provided the accident investigators with an unusual opportunity to examine the aircraft and try to determine the cause of the engine failure. During the subsequent careful examination the investigators discovered that in this fuel-injected engine, the fuel line from the fuel servo unit to the fuel divider was loose. What that meant was that the spray-injection process would not operate correctly and the fuel would be splashed around the engine compartment instead of properly entering the cylinder. Apparently that was what indeed happened, because the investigators found fuel spray patterns all over the inside of the lower engine cowling.

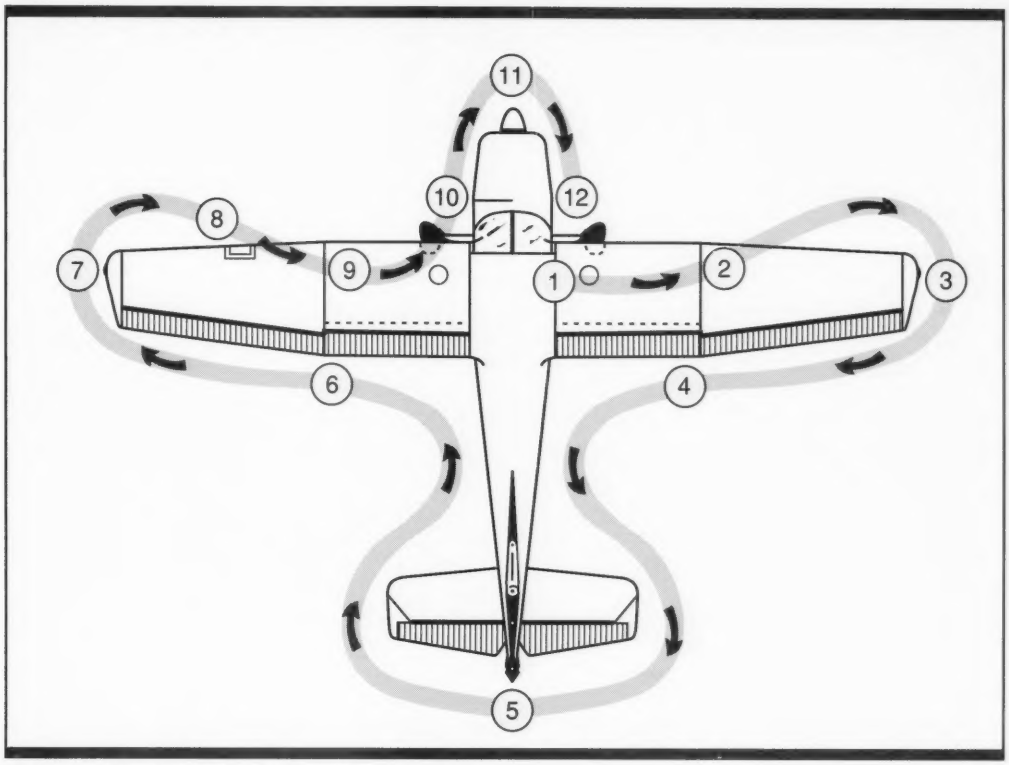
Working back, the investigators then discovered that during recent maintenance on the Cessna, mechanics had installed an overhauled engine and that the aircraft had only about an hour's flying time since that maintenance. What also became obvious was that the pilot had not done a thorough run-up during the preflight before that day's flight. Was that because the Cessna had recently been in the maintenance shop and the pilot thought a detailed preflight was unnecessary? (Actually the opposite is usually the case: An extra vigilant preflight should follow the first few flights after maintenance.) A thorough run-up may have indicated that the *Cardinal's* engine was not getting adequate fuel in the fuel-injection process. At least in this case the pilot was fortunate that he was able to put the Cessna down harmlessly in the water, rather than in some populated area.

For want of a nail . . . . or a good preflight.

The elements of a good preflight inspection may vary from aircraft to aircraft, but the basics are the same for all aircraft, as outlined in the diagram in the *Flight Training Handbook* (Figure 1). Beginning with the cockpit and followed by a careful "walk-around," conducted with an appropriate checklist, a preflight inspection is the first leg of any flight.

The aircraft's checklist (found in the Aircraft Flight Manual or the Pilot's Operating Handbook) contains precise directions for that particular aircraft. This checklist shows you what to look *at*, but you should also know what to look *for*. Here are some of the major things to look *for* while doing a preflight.

Cockpit: A good preflight always starts in the cockpit. Here, at the outset, is the opportunity to check for all appropriate documents, including maintenance entries required under the type of airworthiness certificate the aircraft is operating under, and to check all indicators, switches, knobs, dials, levers, and handles for wear, looseness, accuracy, and proper operation. Also, check the seat adjustment controls, seat belts, and seat-locking mechanisms for proper operation. Properly secure all loose objects and cargo in the



Representative sample: Not approved for aircraft use.

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(1) a. Check quantity of fuel (2 gages).
b. Make sure battery and ignition switches are "OFF."
c. If the fuel gage showed "FULL," remove fuel tank cap and check fuel level visually.

(2) Check right wing for skin damage.

(3) Check navigational light for damage.

(4) a. Remove control surface lock, if installed.
b. Check aileron and flap hinges.

(5) a. Remove control surface lock, if installed.
b. Inspect tail surfaces for dents, cracks, etc. Check surface hinges for cracks and hinge bolts for security.
c. Inspect tailwheel spring, steering arms, steering chains, and tire inflation.
d. Check tail light for damage.

(6) a. Remove control surface locks if installed.
b. Check aileron and flap hinges.

(7) Check navigation light for damage.

(8) Check landing light windows for security and cleanliness.

(9) a. Remove pitot tube cover, if installed.
b. Inspect pitot tube opening for stoppage.
c. Check left wing for skin damage.

(10) a. Inspect main landing gear wheel and brake fairing. Check tire for cuts, bruises, and proper inflation.
b. Inspect airspeed static source hole on left side of fuselage for stoppage.
c. Check oil level. Do not operate with less than nine quarts. Fill to twelve quarts for extended flight. For floatplane, refer to "OIL LEVEL" paragraph in Section I.
d. Inspect cowl access doors for security.
e. On first flight of day, drain a two-ounce quantity of fuel from the fuel strainer to check for the presence of water and sediment.
f. Check cowl flaps for security.

(11) a. Check propeller and spinner for nicks and security.
b. Examine propeller for oil leakage.
c. In cold weather, pull propeller through two revolutions.

(12) a. Inspect cowl access door for security.
b. Inspect airspeed static source hole on right side of fuselage for stoppage.
c. Inspect main landing gear wheel and brake fairing. Check tires for cuts, bruises, and proper inflation.
d. Check windshield and cabin windows for cleanliness.

cabin and cockpit before taking off. (See "Keeping the Flight Controls Free and Correct," May/June 1991 FAA Aviation News.) Turn on the master switch and note the quantities indicated on the fluid gauges (fuel, oil, hydraulics, as installed). Then lower the flaps to see that their actual position corresponds with that indicated on the flap gauge. Before leaving the cockpit, leave the flaps down but TURN OFF the master and magneto switches; you will be checking a prop, after all. Also, remove the control lock, if installed, to permit you to check control movement from the outside.

Fuselage: What the pilot should be looking for here is structural damage, skin wrinkles, missing or loose rivets, deformed or bent landing gear or attach fittings, and bent or deformed wing struts or attach points. Check all antennae for damage and security, and make sure that pitot and static openings are unobstructed. Clogged pitot tubes or static ports call for a mechanic. Blowing into them or probing them with a paper clip or ball point pen tip is taboo. Position, landing, and anti-collision lights should be operating as appropriate to the conditions of flight.

Control Surfaces: After removing the control locks, lift the ailerons and elevator up and down, the rudder left and right unless manufacturer instructions say not to. Make sure the positions of the movable surfaces match the position of the control yoke and rudder pedals inside the cockpit. Misrigging *does* happen. With the flaps in the fully extended position, check them for bent or broken control rods, hinges, mounting brackets, pulleys, or cables. Check to make sure they have extended equally on both sides.

Landing Gear: The tires should be examined for proper inflation, either by eyeballing or using a pressure gauge. Also look for cuts, bulges, or worn spots in the sidewalls or tread. Check the wheel rims for cracks or dents or anything that may suggest a too-hard landing. Check shock or oleo struts—are they flat, are they leaking? Retractable gear requires a more detailed look. Nose gear steering and shimmy damper mechanisms need a check for bent rods, loose cables, missing hardware, or leaks. Brake pads, rotors, discs, and evidence of leaking brake fluid are also on the list.

Prop and Engine: Inspect the propeller for any serious nicks, chips, scratches, or cracks. Controllable pitch propeller blades should be checked for security and oil leaks. Remember, treat the prop as "hot" anytime you touch it or move it. Hopefully, the engine compartment has a cowling that you can open so that the engine gets a good looking over for loose fuel or oil lines, leaks (fuel, oil, or hydraulic fluid), cracked exhaust shrouds, not to mention birds' nests or rodent infestation. For aircraft that do not have large cowling openings, use a flashlight to check as much of the engine compartment as you can see through a small opening. Check the bottom of the engine compartment and the ground below for possible oil or fluid leaks.

Fuel and Oil: Good flight instructors have taught us never to trust the cockpit fuel or oil gauges. Always make a visual check of fuel and oil quantity. For fuel we also have to make sure we have the proper grade (check color) as well as enough to meet either VFR or IFR fuel minimums (FAR §§ 91.151 and 91.167, respectively). Since each pilot should assume that his or her fuel is contaminated with water, a careful check must be made of the aircraft's fuel system for water or any other contamination by following the manufacturer's recommended procedures. For oil the quantity as well as the quality is also important; thick, black, burned oil may not be providing you adequate engine protection or cooling. FAR Part 43 allows the pilot to change the oil as preventive maintenance, and in some cases it is easier than changing it on a car. Just remember to make the proper sign-offs in the aircraft logbook after a runup to check for any leaks and to dispose of the used oil properly.

Taxi: We have covered the "walk-around," but the preflight is not yet finished. After engine start and while taxiing to the active, you should check the brakes, nosewheel steering, and the operation of the radio and other electronics that may be used during the flight. Of course, if you are at a controlled airport, you will have to call ground control before taxi, and that will serve as your radio check. If you have more than one radio, be sure to check both before takeoff.

Engine Run-up: The items on the before-takeoff checklist are not usually considered a part of the traditional preflight, but this checklist is an additional opportunity *before takeoff* for the pilot to ascertain if the aircraft is capable of sustained flight. For an example, during the magneto check portion of the engine run-up, the pilot needs to use all available senses to get a "seat of the pants" feel for the aircraft before it becomes airborne. The senses are these:

Sight: Study the instrument panel. Are all the gauges working and consistent? Do they show the expected levels and readings (as per the AFM or POH)?

Hearing: Does the engine sound right? Is it sluggish or overspeeding? Missing on one or more cylinders? Backfiring?

Touch: Is everything running smoothly or is there excessive vibration?

Smell: Do you smell any excess fuel vapors, burning oil, or anything else inconsistent?

Passenger Briefing: Last but not least, is the passenger briefing. FAR § 91.107 requires pilots to explain when seat belts/shoulder harnesses must be worn and how to fasten and unfasten them. What is not required for a non-revenue flight is how to open/close exits, what to do in the event of an emergency, when you can ask the pilot questions, and when he or she needs a cockpit as sterile as those for the airlines. Although not required by regulation, a prudent pilot will provide complete emergency information to his or her passengers. In the event of an accident, the adequacy of the passenger briefing, and in many cases, the reasonableness of the pilot's in-flight decision making process and actions are often determined by a judge or jury long after the accident. In the event of fatal injuries to both pilot and passengers, a history of complete briefings and a reputation of being a careful pilot may be the only defense a pilot's estate may have in subsequent litigation. That history should include obtaining complete weather briefings, checking NOTAM's, good preflight planning, and using current charts.

If during the preflight, the pilot should find something amiss—misrigged ailerons, asymmetrical flap extension, etc.— then, the pilot should bring the problem to the attention of a mechanic for inspection or repair. *Do not take off!* That is the whole purpose of the preflight—to anticipate and correct a problem before it turns into a disaster.

Granted, some of us consider a preflight inspection to be tedious, dull, and monotonous. After all, most times there is nothing wrong with the aircraft, so why bother? Ah, but in those few cases when there is something wrong, the preflight can alert you to a possible problem on the ground, where troubleshooting is easier. Aloft is not the time to discover something that you should have caught on the preflight.

The enemies of a good preflight are:

Boredom: That ennui that comes from a tedious task which you have done so many times before.

Haste: That impatience to get through this thing and get into the air; especially a problem when it is 10° outside or 90° inside the cockpit.

False security: That complacency, often found in veteran pilots, that tells them that they have done this so many times before and have never found any problems or that they do not need to use appropriate checklists.

However, careful and safe pilots realize that the preflight is a golden opportunity to provide another safety check, no matter how tedious it is or no matter how many times they have done it before. The prudent pilot, as well, also realizes that an opportunity once lost is difficult to regain.

There is also something else about the preflight that appeals to us pilots—it is free. In these days when we are rightfully concerned about the rising costs of insurance, fuel, and operating, the preflight remains the best bargain in aviation. It is a totally free safety check and conducted by someone you trust.

Can *you* afford not to use it? ■

Status of the FAR

By popular demand, the *FAA Aviation News* is publishing a complete list of the Federal Aviation Regulations (FAR) and their latest changes and prices. Any significant changes are mentioned on the "AvNEWS/BRIEFS" pages as they occur.

Many of the FAR are reprinted commercially, some in book form. It is important to keep in mind that the rules are amended often in some cases, and existing provisions may be nullified or changed by this process unless they are updated continuously. Commercial publications may or may not provide updates.

The FAR are sold in two ways by the Superintendent of Documents—subscription and single sales. When you order a subscription, for which there is an annual change, the changes will be sent to you automatically as they are issued. Single sales are a different matter. The changes to these parts are infrequent, and no direct notice of a change is sent out. Therefore, you must order and pay for each change as it is issued.

Another way of obtaining the FAR is to purchase the bound volumes of the U.S. Code of Federal Regulations. Three volumes of Title 14 contain the Federal Aviation Regulations:

Parts 1 - 59	
(SN 869-004-00042-1)	$21.00
Parts 60 - 139	
(SN 869-004-00043-0)	$19.00
Parts 140 - 199	
(SN 869-004-00044-8)	$ 9.50

These volumes are only updated annually, so the latest changes would have be obtained from another source.

The following pages contain the current status and price list for the FAR. Color high-lighting indicates those rules considered of special interest to general aviation pilots.

To order any of the FAR parts, send check, money order, or credit card number to the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9325. Add a 25% charge for foreign mailing on the single sale items. Remember to use the stock number. ■

Parts Sold on Subscription Service

Part	Title	Code Letter	Price Domestic	Price Foreign	Changes Issued
1	Definitions and Abbreviations	FA001	$30.00	$37.50	14
11	General Rule-making Procedures	FA011	27.00	33.75	21
13	Investigative and Enforcement Procedures	FA013	30.00	37.50	12
21	Certification Procedures for Products and Parts	FA021	34.00	42.50	34
23	Airworthiness Standards: Normal, Utility, Acrobatic, and Commuter Category Airplanes	FA023	35.00	43.75	30
25	Airworthiness Standards: Transport Category Airplanes	FA025	39.00	48.50	30
27	Airworthiness Standards: Normal Category Rotorcraft	FA027	35.00	43.50	22
29	Airworthiness Standards: Transport Category Rotorcraft	FA029	36.00	45.00	24
33	Airworthiness Standards: Aircraft Engines	FA033	27.00	33.75	9
36	Noise Standards: Aircraft Type and Airworthiness Certification	FA036	32.00	40.00	23
43	Maintenance, Preventive Maintenance, Rebuilding, and Alterations	FA043	32.00	40.00	14
45	Identification and Registration Marking	FA045	30.00	37.50	16
47	Aircraft Registration	FA047	28.00	35.00	8
61	Certification: Pilots and Flight Instructors	FA061	36.00	45.00	26
63	Certification: Flight Crewmembers Other Than Pilots	FA063	25.00	31.25	12
65	Certification: Airmen Other Than Flight	FA065	30.00	37.50	15
91	General Operating and Flight Rules	FA091	47.00	58.25	10
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93	Special Air Traffic Rules and Airport Traffic Patterns	FA093	31.00	38.75	25
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135	Air Taxi Operators and Commercial Operators	FA135	45.00	57.75	38
137	Agricultural Aircraft Operations	FA137	32.00	40.00	8
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145	Repair Stations	FA145	29.00	36.25	10
150	Airport Noise Compatibility Planning	FA150	30.00	37.50	2
152	Airport Aid Program	FA152	31.00	38.75	12
159	National Capital Airports	FA159	30.00	37.50	13

**Not included with subscription. For a particular FAR Part 91 preamble, write to DOT, M-443.2, Washington, DC 20590.*

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[2]Due to their length, complexity, and frequency of issuance, individual Airworthiness Directives (AD's) are published separately in the Federal Register. Copies of AD's in summary form are sold by DOT/FAA for the Superintendent of Documents. Volume I—AD's for small aircraft is $113.00 (add $28.25 for foreign handling). Volume II—AD's for large aircraft is $130.00 (add $32.50 for foreign handling). Order from: DOT/FAA, AAC-23, P.O. Box 25461, Oklahoma City, OK 73125.

[3]Due to their length, complexity, and frequency of issuance, individual airspace designations, airways descriptions, restricted areas, jet route descriptions, and IFR altitudes are not included in the publication of these basic Parts. Such descriptions are published in the Federal Register and depicted on appropriate aeronautical charts. Aeronautical charts can be obtained from the Distribution Branch, N/CG33, NOS, NOAA, Riverdale, MD 20737-1199.

[4]Standard Instrument Approach Procedures are published in the Federal Register by reference to FAA documents which are available for examination in the Rules Docket (AGC-204) and the National Flight Data Center, FAA Headquarters, Washington, DC, and at the appropriate FAA regional offices and Flight Inspection District Offices. These Instrument Approach Procedures Charts can be obtained from the Distribution Branch, N/CG33, NOS, NOAA, Riverdale, MD 20737-1199.

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SIR FRANK WHITTLE'S PROPLESS MARVEL

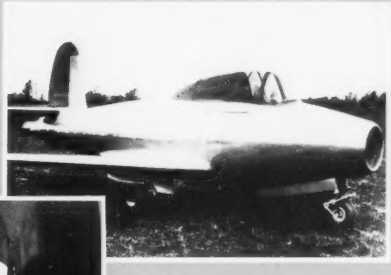
"I saw an airplane come out from the hangars with no propeller! That fascinated me more than anything, as we were used to seeing airplanes with propellers. It took off, circled 'round whistlin', and disappeared into the clouds."

The laborer pouring concrete for a new landing strip at Cranwell RAF Base, England was only one of several persons who witnessed history being made. Seventeen minutes later, the plane successfully landed, still without props. It was a dream come true—the jet age had officially begun in England.

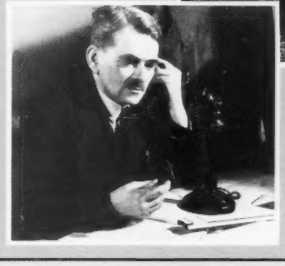
This story really starts thirteen years earlier in 1928 with a final thesis entitled "Future Developments in Aircraft Design." The author was a 21-year old Royal Air Force College cadet named Frank Whittle, the son of a mechanic/inventor. He theorized that jet thrust would result if compressed air were directed to a combustion chamber where the air and fuel were mixed, then ignited. The resulting hot gases would spin a turbine shell, venting exhaust gases backward, and propelling the aircraft forward. At the time huge, gas turbine engines were being used for industrial operations, but major changes in weight and efficiency would have to take place before they would be practical for aircraft propulsion. The main problem was finding materials that could withstand the high stresses and temperatures required for an efficient gas turbine.

Whittle proposed that such an engine would achieve speeds up to 500 mph at high altitude, but his theories were not taken too seriously. The current top aircraft speed was 150 mph, and 500 mph was science fiction.

While Whittle served as a flight instructor at the RAF's Central Flying School and later as a floatplane test pilot at Felixstowe, he continued to develop his ideas on turbojet engines in his spare time. His fellow pilots jokingly referred to his design as "Whittle's flaming touchhole." (A touchhole is an opening in early firearms and cannons through which powder is ignited.) However, by 1930 he obtained a patent. Getting anyone to listen to his ideas was still another matter. With the help of his flight school superiors he met with the Air Ministry, but they labeled the engine "impracticable" and were unwilling to give financial aid. His next assignment was to take an officer's engineering course at Cambridge University where he later took an honors degree in mechanical science.



*The Gloster-Whittle E28/39 **Squirt** powered by the W1 engine– a propless marvel.*



The vital ingredients for development of the jet engine–the young inventor, the telephone and the slide rule

In 1935 the £10 ($22) renewal fee was due on his patent. As he was yet to convince anyone to build his design, Flight Lieutenant Whittle decided that he needed the money more for his growing family. However, two of Whittle's close and sympathetic friends took matters into their own hands and found financial backing for him. After renewing the lapsed patent, they formed Power Jets, Ltd., with Whittle acting as Chief Engineer and Technical Consultant over an initial five-year period. As he was still in the RAF, the Air Ministry granted permission for him to continue the project as long as he spent no more than six hours a week on it—a proviso he promptly ignored.

On April 12, 1937, the Whittle Unit (WU) was ready to be tested. The British Thompson-Houston Company built an engine according to Whittle's design, and a new steel alloy, "stay blade," was developed for the turbine wheelblades and was expected to withstand the stress of turning at over 16,000 rpm. However, in the first two tests the engine went out of control and had to be shut down because of fuel problems before reaching 2,000 rpm. It would take another three years and many modifications before the WU survived the 16,000 rpm test run.

In the meantime Whittle was promoted to squadron leader, and the Air Ministry had become interested in the WU project, so much so that they financed rebuilding the WU twice, plus some other modifications. This government involvement would eventually cause the demise of the company. After the June 1939 test-bed demonstration of the jet engine the Air Ministry thought their money well-spent and commissioned the Gloster Aircraft Company to build an experimental aircraft to flight test the engine. The aircraft had to weigh at least 2,800 lbs. to carry the 623-lb. engine that would produce 855-lbs. of thrust.

Ironically, only two months later, on August 27, 1939, the German's test flew their own jet plane, powered by an engine designed by Hans von Ohain. It would be another year and a half before the British jet would be ready for a test flight in an experimental aircraft.

The flight of the Gloster E.28/39, nicknamed the *Squirt*, took place at Cranwell RAF Base, England on May 15, 1941. It was almost evening before the clouds lifted enough for test pilot Gerry Sayer to take off. Over the next 12 days this small jet-propelled aircraft would reach speeds of up to 370 mph at 25,000 feet and be the prototype for future World War II British and U.S. jet propulsion engine designs. However, the Germans would once again retain their lead in jet development with their introduction of the Messerschmitt 262 in the fall of 1944. A captured ME 262 tested superior to any World War II Allied fighter.

Whittle would eventually sever his ties with Power Jets. He had become increasingly dissatisfied with its technical policy, and when the Air Ministry took over the company in 1944, he surrendered his rights, forfeiting all monies. He supported his family afterwards by lecturing on the development of the jet engine. Then in 1948 several things happened. Air Commodore Whittle was forced to accept a medical retirement from the RAF, but he was also designated Knight of the British Empire and received approximately £100,000 ($450,000, tax free) for his pioneering work in jet propulsion. He eventually retired to the place of his birth, Coventry, England.

At a time when others thought Whittle's ideas and designs were the stuff science fiction was made of, he never gave up his dream. His work helped lead the way into the jet age and beyond. ■

SURVEY

As you can tell from the above comments, the results of the *FAA Aviation News* survey we told you to expect in the May-June 1991 issue are in. Normally, a very low percentage of people sent any type of survey form ever respond. In our case, the U.S. Government Printing Office sent survey forms to about 2,100 subscribers, and 1,386 readers took the time to respond to the rather lengthy form. The high return rate, 66 percent, is indicative of the character of the magazine's subscribers surveyed and their interest in improving the magazine. That is why each of you deserves our thanks. We also need to thank Renee Marshall of the Accident Prevention Program for her help in tabulating the survey data. Helping her in that tedious task were Sheryl Robinson and Danielle Adams. (We have promised them not to do a survey like this again anytime soon.)

The survey provided an interesting insight into our "typical" reader and his or her opinions regarding the magazine. First, as this and the previous two issues of the magazine prove, we have already been responding to the comments about improving the appearance and quality of the magazine. Second, the survey proves airman have definite opinions and are willing to voice them when asked, even to the FAA.

Most of those surveyed liked the magazine. A few claim to hate it but have subscribed for years. Some said the magazine is a public relations piece for the FAA. (Remember, the magazine's title is **FAA** Aviation News) Some thought we could not even spell FAA. But overall, most of the respondents thought we provide important information that is difficult to get from other sources— even if we did present the information in a rather boring manner using outdated photographs. Needless to say, the magazine is working on improving both its content and photographic quality. However, the responsibility is not entirely ours. The Aviation News Staff welcomes stories and photographs from its readers. If you have a good safety story please send it to us for review, or call us and we will discuss it over the telephone. This is *your* magazine after all. We prefer color slides, but top quality color photographs will do. We cannot pay you, but we can give you a photo credit or byline that you can show at your next hangar flying session. Send your comments to the magazine by writing to: Editor, *FAA Aviation News*, AFS-20, 800 Independence Ave. S.W., Washington, DC 20591. The telephone number is (202) 267-7953 or 7956.

Now, who is the average subscriber. Based upon the survey, we were surprised to discovered there are *two* "typical" readers. He (95 percent of the respondents were male) is either a private pilot (57 percent) or a commercial or ATP pilot (40.8 percent). Both are over 40 years of age. The two "typical" pilot groups are further broken down into two groups based upon flight time. The "typical" pilot either has a lot of flight time or very little flight time. Furthermore, the high-time pilot has flown a lot of hours during the last 12 months, and the low-time pilot has flown very few, in many cases (29 percent) less than 25 hours during that same time period.

The fact we have two clearly different "typical" readers presents the magazine staff with an interesting challenge. The challenge is how to produce articles that address the needs and interests of our two identifiable groups of readers that differ so significantly in pilot experience and currency without losing the interest of either group. The survey also showed us that the "Age Wave" has reached the people (50.7 percent of the respondents are over 50) who fly the aging aircraft we hear so much about. Based upon the survey, we could leap to the false conclusion that the magazine should provide more articles on the effects of pilot aging, or at least more maintenance type articles, but then we would be ignoring the needs of our younger, less-experienced pilots. So in addition to the challenge of addressing the differing needs, based upon the flight time and currency, of our *two* typical readers, the magazine staff must also address the question of our readers' age. We must provide information that is of interest to not only the new, inexperienced, 17-year-old student pilot who at 17 feels immortal, but we must also provide information of interest to the older, more mature pilot who has been flying for years. And while we are trying to keep both of our current "typical" pilot groups happy, both young and old, we must attract the new, low-time student, recreational, private, and medium-experience pilots, and women we apparently are missing. Since our job is to serve the needs of all aviators, our goal in the course of next year is to provide something for everyone. And since we are part of the FAA, we have access to important safety information that is of benefit to all, regardless of their experience, gender, or age. *FAA Aviation News* wants to disprove the expression, "There are bold pilots, and there are old pilots, but there are no old, bold pilots." We want to ensure that all pilots live to be old pilots with enough boldness to make life interesting.

The survey results give us the insight we need to produce the types of articles you want. If, at any time, any of you feel we are not addressing your needs, before you punish us by not renewing your subscription, please write and tell us about it. *We will answer every letter, either in the magazine, by letter, or by both means.*

It is up to you to keep us on our toes. ■

Portions of the survey have been reprinted below along with the responses for each question. Because some readers did not answer every question, the totals may not always add up to 100 percent. We will continue to analyze the data and use the results in our planning for future articles. Again, we want to thank everyone who responded to the survey.

What type of Airman rating(s) do you hold?

Air Traffic Controller **12**	Aircraft Dispatcher **9**
Flight Engineer/Navigator **26**	Mechanic, Airframe **9**
Mechanic, A & P **72**	Mechanic, IA **1**
Pilot **1,229**	Parachute rigger **1**
Repairman **0**	Other **16**

How many years have you been certificated?

Less than 1 year **16**	
1-2 **84**	6-10 **200**
3-5 **283**	11 or more **783**

If you are a pilot, what type of certificate(s) do you hold?

Student **21**	Recreational **6**
Private **791**	Commercial **435**
Airline Transport Pilot **130**	Flight Instructor **296**

If you are a pilot, what rating(s) do you hold?

Single-engine land **1,238**	Multiengine land **440**
Single-engine sea **140**	Multiengine sea **26**
Helicopter **69**	Gyroplane **1**
Airship **1**	Free balloon **12**
Glider **102**	Instrument airplane **684**
Instrument helicopter **30**	

What is your age?

14-18 **0**	30-39 **253**	60-69 **275**
19-21 **4**	40-49 **346**	70 + **78**
22-29 **62**	50-59 **331**	

How many hours have you flown during the past 12 months?

0-25 **393**	51-100 **285**	201 or more **201**
26-50 **257**	101-200 **217**	

How many total flight hours do you have?

0-25 **9**	101-200 **185**	1,001 or more **554**
26-50 **6**	201-500 **328**	
51-100 **46**	501-1,000 **228**	

How long have you subscribed to *FAA Aviation News*?

1 year or less **189**	5-7 years **196**	11+ years **238**
2-4 years **592**	8-10 years **150**	

What type of stories do you want to read? (In some cases, more than one was selected.)

Aircraft maintenance **92**	Preflight **32**
Navigation **81**	Piloting techniques **378**
Safety **328**	FAR rule changes **321**
Historical **41**	Accident reports **129**
Air Traffic Control procedures **147**	Other **18**

CRM COCKPIT RESOURCE MANAGEMENT

As vital in a trainer as in a jet airliner

by Don Petrin and John Young

Consider these mishaps:

1. A Cessna 172 slams into a Massachusetts mountain after the non-instrument-rated private pilot experiences spatial disorientation during poor weather. (*NTSB Reporter, Vol. 8, No. 5, May 1990*)

2. An instrument and multi-engine-rated pilot crashes his twin Cessna into the center divider along a California state highway. His doctor had urged avoidance of flight activity after hearing complaints of headaches, forgetfulness, and disorientation. (*NTSB Reporter, Vol. 8, No. 1, Jan. 1990*)

3. A 20-year-old airman plants his Beech *Sundowner* nose first into the ground while performing low-level acrobatics for his friends. (*NTSB Reporter, Vol. 8, No. 3, March 1990*)

Although each of these accidents might be attributable to pilot error—an oversimplified phrase suggesting inappropriate pilot behavior—closer scrutiny would reveal a myriad of causal factors related to CRM, cockpit resource management. [Editor's Note: the FAA now refers to CRM as *crew resource management*.]

NEED FOR CRM TRAINING

Cockpit resource management (CRM) is a means to effectively integrate pilot, aircraft, and environment for safer, more efficient flight operations. Since 80 to 85 percent of all aircraft accidents during the past 10 years have been attributable to human error, CRM training has been receiving increased attention.

In earlier days, mechanical failure was the primary cause of accidents. But as aircraft design and materials have improved and manufacturers have created more reliable aircraft, only a small percentage of aircraft accidents now result strictly from equipment malfunctions. The same cannot be said about the human element. As pilots, we have become the weaker of the two links.

Fortunately, the airline industry and the FAA have recognized this and are creating guidelines for CRM training. Many airlines now require initial and recurrent CRM training and give preference to pilot applicants who have had previous CRM experi-

ence. Additionally, the FAA Practical Test Standards require competency in selected cockpit management areas during private pilot, commercial pilot, certified flight instructor, multi-engine, and airline transport pilot flight tests.

Private pilot applicants (airplane, single-engine land) must be evaluated on knowledge of cockpit management relating to safety and efficiency factors, efficient organization and arrangement of material, and crew coordination. Commercial applicants are similarly graded on efficient procedures for cockpit management and related safety factors.

Although competent flight instructors can teach flying's technical aspects (such as slow flight or ground reference maneuvers), management skills, such as organization, setting priorities, monitoring, and problem-solving are often missing. Even when these skills are taught, it is usually on a "hit-and-miss" basis—some students are well-trained while others receive little or no training. A more structured approach to CRM training can ensure that all students develop flight management skills.

One effective strategy is to promote CRM development throughout the flight training process while students are honing traditional psychomotor skills.

CRM ELEMENTS

A rudimentary CRM program should include these elements: communication, decision-making and problem-solving, situational awareness, standardization, leadership/followership, psychological factors, and stress management.

Communication as applied to single pilot operation includes improving both speaking and listening skills. Pilots must exchange information with a wide variety of people: air traffic controllers, flight service specialists, maintenance technicians, FBO personnel—and other pilots.

A useful publication for discussing communication problems is *A Call to Action: Joint FAA/Industry Partnership to Improve Pilot/Controller Communications.* Available from the FAA's Public Inquiry Center (APA-230, Washington, DC 20591) it described 12 areas of concern, including background and history, specific examples of the problem, and potential solutions/preferred techniques. Phraseology, radio discipline, stuck microphones, and read-back problems are a few of the areas discussed in the booklet.

Decision-making and problem-solving concern response to both "structured" (those having known dimensions and solutions) and "unstructured" problems (those with poorly defined circumstances and unknown solutions). Strategies for choosing an appropriate course of action can be presented.

A six-step decision-making model has been developed at Ohio State University.

The steps of the DECIDE model are:

- **D** - Detect that a change has occurred.
- **E** - Estimate the significance of the change.
- **C** - Choose a safe outcome.
- **I** - Identify plausible actions to control the change.
- **D** - Do something.
- **E** - Evaluate the effect of the action.

A student taught to use these steps will consistently make better decisions. With practice and time, the steps will become second nature. Similar models can be used to teach problem-solving.

Situational awareness concerns knowledge of one's spatial location, error chain recognition (the sequence of milestone events preceding an impending accident or incident), consciousness of what is or is not occurring, and identification of clues signifying loss of situational awareness.

> Cockpit resource management (CRM) is a means to effectively integrate pilot, aircraft, and environment for safer, more efficient flight

For example, let us say you are pilot in command (PIC) of a VFR aircraft being sequenced by radar approach control at a busy airport. You are told to descend and asked to maintain a higher than normal airspeed for separation. You also receive several heading changes and traffic advisories. Traffic behind your Cessna 172 is a rapidly approaching DC-9.

Approach hands you off to the tower. You cannot immediately talk with the tower because of frequency congestion. Finally, on one-mile final you call the tower and are told to turn left and enter right base for an intersecting runway. You find yourself high, fast, and in an unanticipated position in the pattern.

Slightly confused, you fixate on the airspeed indicator and altimeter. Since you are fast, you must deviate from your normal sequence by extending flaps later and closer to the ground. While the landing will hopefully be uneventful, confusion, fixation, and failure to meet targets (airspeed, for example) suggest reduction of situational awareness and may result in an accident. Prior knowledge of these clues might avert a catastrophe.

Standardization training involves seemingly mundane yet vitally important issues, such as checklist discipline and procedural training. Have you ever flown with someone who did not use a checklist during the entire flight? Have you ever been in a hurry and started the engine for your student without accomplishing the "Before Starting Engine" checklist while telling your students to always use the checklist when they fly solo? Guest what? Your students will imitate you when they fly solo.

Standardizing checklist names and items among the aircraft in your fleet will aid in cockpit management. Transition to new aircraft or moving between aircraft will be much easier with standardized checklists. Students will be less likely to make errors.

Both "challenge/reply" and "flow" techniques should be discussed and practiced by the student. With challenge/reply, the pilot reads a checklist item and the response, then performs the task. By contrast, the flow method involves following a pre-learned pattern while using the checklist as a backup.

Leadership/followership style is a study of the desirable characteristics found in a good leader and follower. Leadership traits include technical and professional competence (knowledge of systems, regulations, weather, etc.), courage, enthusiasm, and flexibility. Communication skills, responsibility, humor, and ability to follow directions illustrate good followership.

A good leader will effectively manage those persons who contribute to the safety of the flight. Assuring that the lineman fuels the aircraft with the proper grade and quantity of fuel, verifying with the mechanic that maintenance write-ups have been cleared, and working with ATC when a clearance cannot be followed are but a few examples.

Some situations may require a pilot to be a good follower. As safety-conscious, responsible pilots, we must take the initiative to ask for help even when we are slightly

disoriented. Learning to speak up and following instructions will increase the chances of a safe landing.

Psychological factors in CRM training include attitude, personality, and motivation in the decision-making process. Attitude includes the cognitive (thought), affective (emotional), and behavioral (action or response). Hazardous attitudes such as anti-authority, impulsiveness, invulnerability, machismo, and resignation are studied.

As an illustration, consider the accident cited earlier involving a Beech *Sundowner* and low-level acrobatics. Feelings of invulnerability or machismo in reaction to a peer challenge may have precipitated this event.

Personality, by contrast, concerns individual style in coping with problems (e.g., the role of the "right stuff," "wrong stuff," or "no stuff"). The "right stuff" represents a balance between goal orientation, leadership, sharing, and interpersonal skills, while the "wrong stuff" implies autocratic, dictatorial traits combined with poor interpersonal skills and an inability to express feelings. "No stuff" suggests the absence of achievement motivation and leadership skills combined with verbal aggressiveness. Type A individuals who are overly competitive, time-dominated, and multiphasic (able to perform several tasks simultaneously) sometimes tend toward the wrong stuff.

To further explain the role of personality, Air Force psychologists proposed the "Crash As One Lives" theory of aircraft accidents. It contends that milestone events preceding an accident occur in a tempo and fashion paralleling the pilot's lifestyle.

Students in single-pilot operations also need the "tools of cockpit resource management to address problems not contained on checklists or in flight

Motivation as it relates to internal and external factors should also be examined. Are individuals drawn to a goal by its attractiveness or are they driven by an outside stimulus to perform? For example, a non-instrument-rated private pilot continues on into what is clearly marginal VFR weather in order to arrive at an important business meeting. What motivations nurtured this risk-taking behavior? A personality assessment, such as the Strength Deployment Inventory, might also provide CRM students with insight regarding the reasons for their particular drives.

Stress management, the final area in a CRM training course, examines differing personal responses to stimuli and whether the response is "healthful" or "hurtful." Stress, the physiological and psychological reaction to demands placed on a person, may be either chronic (long-term) or acute (short-term). Short term stress might result from an argument, flying a difficult approach, or performing a non-standard cockpit procedure. Chronic stress could arise from career discontent, long term illness, or serious marital discord.

Indicators of inadequate stress coping include depression, withdrawal, denial, overcompensation, headache, appetite change, tardiness, and reluctance to accept responsibility.

Consider this illustration: A student pilot who has just worked 10 particularly frustrating hours at his daytime job must complete two hours in the practice area to be ready for a private pilot checkride at 8 a.m. the following day. After driving five miles through heavy traffic, he arrives at the airport with barely two hours of daylight remaining. His favorite aircraft, dutifully reserved for the flight, is in the shop having a new magneto installed. The mechanic says he needs just 15 more minutes, but it is getting dark. If the pilot cannot fly tonight the next available examiner slot is four weeks away.

Airline pilots flying light planes are on (their) own with no airline to do the work for them.

This person is experiencing stress that may result in an inappropriate decision. CRM training can help the individual recognize cues suggesting stress onset and provide coping strategies.

THE CFI's ROLE

Clearly, CRM training must not be limited to the corporate, commuter, or airline multi-crew environment. Students in single-pilot operations also need the "tools" of cockpit resource management to address problems not contained on checklists or in flight manuals. Flying requires considerable decision-making and judgement skill.

As instructors, we have contact with students through all phases of flight training and can act as role models during contrived and actual flight situations. The authors are convinced that students learn best by "doing" and "experiencing" under the guidance of their personal CFI's. It is imperative that the CFI emphasize sound CRM concepts both by example and illustration.

At Purdue University, flight and ground instructors are integrating CRM principles into all phases of the flight program. For example, structured methods for teaching decision-making are being developed for primary, commercial, and instrument students. Decision-making theory, strategies, and practice situations are contained in the following publications:

- *Aeronautical Decision-Making: Student and Private Pilot Manual*
- *Aeronautical Decision-Making: Instructor Guide for Student and Private Pilot Manual*
- *Aeronautical Decision-Making: Instrument Pilot Manual*
- *Aeronautical Decision-Making for Commercial Pilots*
- *Aeronautical Decision-Making—Cockpit Resource Management*

The first three documents may be purchased from the AOPA Air Safety Foundation. The last two are available from the Flight Safety Foundation (421 Aviation Way, Frederick, MD 21701) and the National Technical Information Service (5285 Port Royal Road, Springfield, VA 22161), respectively.

Checklist discipline and management skills within the cockpit are also being taught. A cockpit resource management course requiring active student participation is being offered. Video cameras are mounted in simulators to record student performance and the interaction with ATC and other crew members. A CRM training seminar for instructors will be offered in the near future.

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CALLBACK ASRS

From NASA's Aviation Safety Reporting System

Number 145 ... 1991

BIG LESSONS IN SMALL COCKPITS

EDITOR'S NOTE: Complimenting the preceding article is one that appeared in Callback, NASA's monthly bulletin from the Aviation Safety Reporting System (ASRS).

Air carrier and light plane pilots may appear to have little in common except the airspace they occupy. Yet a number of airline pilots enjoy flying small planes in their off-duty hours. Going from a big cockpit to a smaller one can offer some meaningful "on-your-own" lessons, according to several airline pilots recently reporting to ASRS.

• On a long night flight only one hour from my destination, as I adjusted my seat and body position, I inadvertently knocked off the avionics switch. This shut down all communications and navigation. I realized the problem very quickly (two minutes or so) and reactivated the avionics switch. As Murphy's law would have it, Center called me four times during my brief absence from the airways. The controller proceeded to remind me to listen up. I guess I can't blame him!

. . . In the future, I will be more careful when adjusting seat and body position in a small aircraft . . . [and] be extremely careful when moving around in tight cockpits. Also be alert for important switches that can be easily moved whenever you change body positions. . . . Be especially careful for circuit breakers, autopilot, and avionics switches.

• The controller advised me that my track was 40 degrees to the right of the headings he was giving me. He advised me to recheck my compass and directional gyro. Sure enough, they were off. I corrected and continued to the destination without incident.

The lesson learned here was a back-to-basics reminder. Every 15 minutes or so you must check directional gyro against the compass. As an airline pilot flying jets, this task is accomplished automatically, so it's easy to forget. Once again, airline pilots be careful when flying small airplanes. Review the basics and be prepared to use them!

• While discussing the weather conditions and filing my IFR flight plane with the FSS briefer, I forgot to give an alternate. My destination had a chance of weather conditions that would require an alternate but current weather was much better than had been forecast . . . The factors leading up to the oversight included:

1) Normally, as an airline pilot I don't get involved with dispatch and flight planning . . .

2) Not writing out an IFR flight plan in advance. Instead, just reading off a blank form giving most of the info from memory. . . . Airline pilots flying light planes are on [their] own with no airline to do the work for them.

• Seaplane Handling

I was very much impressed with the way my article on "Seaplane Handling in Strong Winds" (March/April 1991) turned out, especially the illustrations. The picture of a seaplane on water in its natural surrounding was perfect as was the float plane taxiing on the step. They added real life thrill of flying floats to the article.

I trust your readers enjoyed the article and please be assured that I will gladly answer all correspondence if anyone has any questions.

George C. Snyder
Addison, IL

If anyone wishes to contact Mr. Snyder, we will forward your questions to him.

• AD Responsibility

I am surprised that FAR § 39.3 [It says no person may operate a product, the definition of which includes aircraft, for which an airworthiness directive (AD) applies, except in accordance with the AD.] is not reiterated verbatim in FAR Part 91. I am aware of one private pilot who has never read FAR Part 39, and who is not aware of its requirements. Editor's note: FAR Part 39 pertains to airworthiness directives.

Ross R. Spencer
Wichita, KS

FAR Part 91 does require compliance with FAR Part 39. Airworthiness compliance is a shared responsibility between the aircraft owner or operator, the FAA certificated mechanic working on the aircraft, and the pilot planning on flying the aircraft. Each has certain responsibilities regarding flight safety as outlined in the FAR.

FAR § 91.403 states an aircraft owner or operator of an aircraft is *primarily* responsible for maintaining that aircraft in an airworthy condition, including compliance with FAR Part 39. FAR § 91.7 says no person may operate a civil aircraft unless it is in an airworthy condition. It further states the pilot in command is responsible for determining whether the aircraft is in condition for safe flight.

So, to answer your question, although the aircraft owner has *primary* responsibility for ensuring an aircraft is airworthy, a pilot can not fly the aircraft unless it is airworthy. For an aircraft to be airworthy, all AD's pertaining to it must be complied with. If the pilot in command has any doubt an aircraft is not airworthy, the pilot must ensure it is airworthy before flight. This check by the pilot means ensuring all airworthiness requirements have been complied with, including AD's.

As you can see, FAR Part 91 does require compliance with FAR Part 39 albeit indirectly.

• Downgraded Medical

In March/April 1989 issue of the News I enquired whether a commercial pilot whose medical had been downgraded from second to third class, was still eligible to take the CFI. The answer was "Affirmative," but your answer to a question in the January/February 1991 issue directly contradicts the earlier answer. Please clarify.

Name Withheld

FAA policy is that an applicant for the original issuance of a flight instructor certificate must hold a commercial pilot certificate and at least a third-class medical to serve as pilot-in-command of the aircraft used for the practical test. Once a person becomes a CFI, he/she need not hold a valid medical unless it is necessary to serve as pilot-in-command or as a required crewmember while giving instruction. Then a third class medical will suffice.

INSTRUMENT CORNER

• To Proceed or Not to Proceed

A pilot is enroute IFR in IMC, has been cleared to the destination airport, has experienced complete communications failure, and does not encounter VMC. Should the pilot hold at the IAF until the calculated ETA, or should the pilot proceed with the descent and approach immediately upon reaching the IAF?

I was taught the former and have never encountered anyone who has expressed a different view, until recently, when both a tower controller and a FSDO inspector told me the latter would be correct. Their logic was that FAR § 91.185(c)(3) does not apply since the clearance limit is the airport and not a fix of any kind. What do you say?

Mark Bennett
Salt Lake City, UT

We tend to agree with the controller and the inspector. Since the pilot has been cleared to the destination, FAR § 91.185(c)(3), "Leave clearance limit," would not apply. FAR § 91.185(c)(1) would: The pilot must continue the flight by the route assigned in the last ATC clearance the pilot received. If the pilot was cleared to the destination, ATC will be expecting the flight to proceed with the approach, not hold at the IAF. To alert ATC that there is a two-way radio failure, remember to squawk 7700 for one minute then 7600 for 15 minutes or the remainder of the flight, whichever comes first. Repeat as practical. Also, some controllers, when they realize or suspect a pilot has radio failure, will continue to broadcast instructions in case the aircraft still has receive capability. Unless leaving the transceiver on would create an added emergency (e.g., an electrical system fire, or too much of a distraction) try to leave the radio on the speaker or the headset.

FAA AVIATION NEWS welcomes comments from our readers. Letters may be edited for style and length. We will not print anonymous letters, but we will withhold names on request. Address: FAA AVIATION NEWS, AFS-20, Washington, DC 20591.

• Weather Option

A couple of questions came up about the forecasts for alternate weather required by FAR § 91.169(c) and 135.221.
(1) If no terminal forecast exists, can the area forecast be used?
(2) When using the forecast, do we have to take into account "occasional," "chance of," and "slight chance of" when determining if we have minimums?

I have been told that we must use the "occasional" etc. This many times creates the ridiculous situation where we can safely go VFR but not legally IFR. I need to know what is the FAA's official interpretation of this rule.

Charles M. Jamieson, Jr.
Metairie, LA

(1) No. A terminal forecast is required for determining alternate minimums. Ref: U.S. Standard for Terminal Instrument Procedures, Para. 122.

(2) Yes. The FAR require weather conditions to be at or above authorized minimums at ETA. If these words or phrases indicate that minimums may not be met at ETA, they must be considered when determining if the forecasted minimums meet FAR requirements at the ETA.

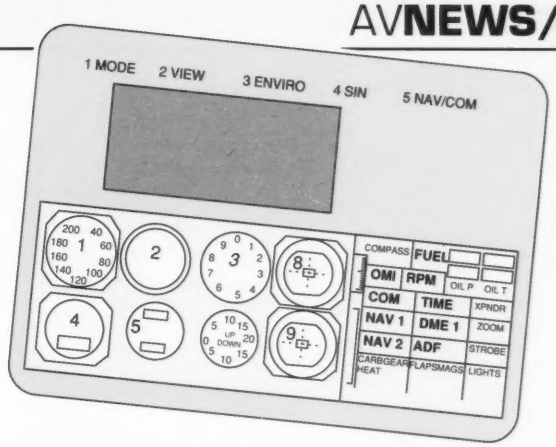
MISLEADING ADVERTISEMENTS

The Federal Aviation Administration (FAA) has become increasingly aware of advertisements appearing in various aviation publications which either state, or strongly imply, FAA approval of personal computer (PC) adaptations of training devices for use under Parts 61 and 141 of the Federal Aviation Regulations (FAR). The fact is that there is no basis for these advertisements. One such advertisement lists an application for FAA approval as part of the package, but fails to mention that the FAA has not granted approval for the use of any such training device software packages under either FAR Parts 61 or 141.

Based on an evaluation of a number of these devices and their associated software, the FAA has determined that those evaluated contain insufficient fidelity with general aviation aircraft to ensure the development of desired psychomotor skills and coordination to support specific training, currency, or certification requirements. A listing of the more common characteristics deemed unacceptable are as follows:

1. Flight and instrument control methods are either unconventional or nonstandard
2. Insufficient fidelity in real time, imagery, and control response
3. Resolution of flight instruments
4. Update rate of flight instruments is in steps or incremental movement
5. Instrumentation is either absent, superimposed, or presented in multiple panels to be selectively viewed by the pilot
6. Ground and flight environments are not realistically portrayed
7. Data used is not readily identifiable with generic or specific aircraft data

Because of the critical impact the use of such devices may have on flight safety, no approvals have been granted for the use of such software packages, to date, for training under FAR Parts 61 or 141, and none are anticipated until the capabilities of such devices have been fully explored. The FAA has no objection, however, to their use as video games or training aids where such use cannot be credited under FAR Parts 61 and 141, toward the certification or currency requirements for pilot crewmembers. Individuals thinking of buying such devices or software need to be aware of their limitations and lack of FAA approval. Questions regarding such devices should be referred to the local flight standards district office.



PILOT SAFETY REVIEW SHOWS THREE COMMON ERRORS

A recent review of FAA daily reports indicates three common pilot errors being made almost daily somewhere in the country. Each has the potential to cause a serious accident.

The first is pilots flying through their assigned altitudes while climbing or descending, and conflicting with other traffic. The problem seems particularly acute at or near VOR's. The cursory review indicates that all categories of aircraft and pilots are involved. Aircraft "busting" altitudes include airliners, military aircraft and general aviation aircraft. The reports indicate while many of the aircraft are on IFR clearances, many are VFR flights that may or may not be in contact with ATC. Because of the threat of a mid-air collision, pilots should be careful when changing altitude to ensure they understand their assigned altitude, go only to that altitude and comply with any specific ATC instruction while doing so. This may be a "hearing" problem where pilots and controllers "hear" one thing and think and do another. Based upon the reports, all pilots should be extra careful near VOR's because of the volume of traffic near them that may be changing altitudes and which may or may not be in contact with ATC.

The second problem may be another "hearing" problem. Pilots continue to cross runways without clearance, land on the wrong runway, fail to hold as instructed and land without contacting the tower. The number of times these types of incidents occurs means that all pilots must be vigilant whenever operating an aircraft on or near an airport. In some cases, these operational errors did not cause any conflicts with other traffic. In other cases, landing aircraft had to go around or departing aircraft had to abort their takeoffs. Aircraft are not the only threat on the surface of an airport. Occasionally, a surface vehicle will cross or be on a runway or taxiway without authorization. Everyone must be prepared for the unexpected.

The third error that continues to appear in the reports is pilots entering terminal control areas (TCA's) and airport radar service areas (ARSA's) without authorization. Simply reminding pilots that "Thou shall not enter TCA's without authorization" doesn't appear to work. All pilots flying in or near TCA's need to review the rules and operating requirements for entering TCA's and comply with them. Ignorance is no excuse for "busting" a TCA. TCA's are printed on every chart and each TCA has a special VFR chart to aid VFR pilots flying in or near the TCA. As a reminder, the FAA is very good at tracking and identifying aircraft that violate TCA's. The FAA's intent is not to necessarily violate wayward pilots but to ensure the flight safety of all in the high density TCA environment.

These three problems may all be "hearing problems" involving pilots and controllers not understanding each other. One way to eliminate much of the confusion is for everyone to make sure they understand what is expected of them and then to comply. One good source for information regarding what actions are expected of everyone operating or controlling aircraft either on the ground or in flight is the FAA's AIRMAN'S INFORMATION MANUAL. The AIM is the FAA's official guide to basic flight information and ATC procedures. It provides the fundamental information all pilots need to know to operate safely within the National Airspace System, plus other important safety, health and medical information. It also has a pilot/controller glossary that might help pilots understand what is expected of them when they receive certain ATC instructions. The AIM, updated periodically throughout the year, is available by subscription from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

In addition to the AIM, the FAA, various industry groups, and pilot organizations, such as the AOPA Air Safety Foundation, all produce many safety related books and pamphlets to help make aviation safe for everyone. Safety is no accident.

ADVISORY CIRCULAR UPDATE

What do you know about Mach numbers, MEL's, type ratings, FAR Part 61 changes, or the new high altitude flight checkout requirement? If you say not much, maybe you should read the following Advisory Circulars (AC) available from the FAA.

AC No. 61.107, dated January 23, 1991, titled: Operations of Aircraft at Altitudes Above 25,000 feet MSL and/MACH Numbers Greater Than .75 MACH. The AC discusses the special physiological and aerodynamic considerations pilots need to know who are transitioning to aircraft capable of operating within this realm of flight.

AC No. 91-67, dated June 28, 1991, titled: Minimum Equipment Requirements for General Aviation Operations Under FAR Part 91. The AC provides information for operating aircraft under FAR 91 with certain inoperative instruments and equipment which are not essential for safe flight.

AC No. 61.65C, dated February 11, 1991, titled: Certification: Pilots and Flight Instructors. The AC provides guidance for pilots and flight instructors on certification standards, written test procedures, and other requirements contained in FAR Part 61.

AC No. 61.89D, dated February 21, 1991, titled: Pilot Certificates: Aircraft Type Ratings. The AC provides a sample type rating curriculum for schools to develop a training course outline for FAR Part 61 and 141 programs. It also has a list of type rating designations that include both the old and new type ratings.

AC No. 61-98A, dated March 26, 1991, titled: Currency and Additional Qualification Requirement for Certificated Pilots. The AC provides information for certificated pilots and flight instructors to use in complying with the flight review required by FAR § 61.56, recent flight experience requirements of FAR § 61.57, and the general limitations in FAR § 61.31(d), (e), and (g). It also provides guidance about transitioning to other makes and models of aircraft.

For new airmen not familiar with the AC system, AC's provide a practical means of distributing nonregulatory information of interest to all pilots. Some AC's are free. Others are sold through the Government Printing Office in Washington, D.C., and its bookstores located in major cities.

For complete information on the AC system and how to order AC's, you can request AC 00- 2.4, dated October 15, 1990, titled, Advisory Circular Checklist (and Status of other FAA Publications) from the FAA. The AC describes all of the current AC's and provides complete ordering information, including the address and telephone number of each of the GPO bookstores. It can be ordered by writing U.S. Department of Transportation, Utilization and Storage Section, M-443.2, Washington, DC 20590.

Photograph courtesy of Bell Helicopter Textron, Inc.

FAR PART 157 AMENDMENT

Pilots no longer have to notify FAA 90 days in advance whenever they plan to land in a residential, business, or industrial area. An amendment to Part 157 of the FAR signed by FAA Administrator James Busey on July 19, 1991, deletes the requirement. Revised Part 157, which was to have gone into effect February 27, 1991, would have required aircraft operators to notify the FAA 90 days in advance of whenever they planned to land at temporary airports within a control zone, within a certain distance from another airport, or in a residential, business, or industrial area. The 90-day-notification requirement was because the revised Part 157's definition of an airport included any temporary landing area. Because of the problems the Rule would have caused, the revised Part 157's implementation date was delayed until August 30, 1991, so that the amendment could be revised. The new amendment also removes the 90-day-notification requirement for those operators who intend to use on an intermittent basis of less than one year a site that is not an established airport. Operators conducting such operations should review the new amended Part 157 for complete details. The other requirements in the revised Part 157 pertaining to notices of construction, alteration, activation, and deactivation of airports, and establishment of or changes in airport traffic patterns remain.

HANDS ACROSS THE WATER - EIGHTH ANNUAL FAA/JAA MEETING

Aircraft certification, maintenance, and operations representatives from the FAA and its European counterpart, the Joint Aviation Authority (JAA), met in The Hague, Holland earlier this year to report progress on harmonization of regulations. The Hague is Holland's center of government and site of the World Court.

The JAA, founded by various European aviation authorities in the early 1970's, has 19 member countries in Europe. Their goal is to develop a common set of standards for airmen and aircraft in Europe and to bring their regulations more in line with the U.S. Federal Aviation Regulations (FAR), a process called "harmonization." This would better facilitate operations of U.S. aircraft in Europe and vice versa.

European and American specialists participate in various working groups on topics such as mechanic training and qualifications, aircraft certification standards, quality assurance of products and services, and third party accreditation. Two hundred fifty people from 30 countries listened to two days' of progress reports from the various working groups. FAA and JAA officials reported definite progress in the harmonization effort. FAR Part 145 and JAR 145 (Repair Stations) have almost completed the harmonization process, and several other rulemaking projects should be jointly completed within the year. When certain airworthiness and maintenance issues finish harmonization, both FAA and JAA officials foresee a shift toward more operational issues such as flight manuals and simulator use. FAA and JAA specialists also expect more general aviation issues to be part of future working groups.

FAA's Thomas Accardi, Director of the Flight Standards Service, and Craig Beard, Director of the Office of Aircraft Certification, lead the FAA delegation at the meeting. They were but two of 30 FAA participants or observers.

Holland apparently has a great attraction for JAA: At the meeting JAA announced that JAA's permanent headquarters will be situated in Hoofdoorp, Holland near Schipol Airport (southeast of Amsterdam) as of December 1991. JAA has been temporarily housed at Gatwick Airport in England.

The FAA will host the 1992 9th Annual FAA/JAA Meeting in the United States at a site yet to be determined.

Lighter than Air Aircraft...

Photograph courtesy of Goodyear.

Captain Drew Marshall, one of the Spirit of Akron's five pilots, discusses airship safety during a flight on the airship.

Continued from page 5

mind pilots flying near one of the giant airships of things they should remember, things they should do, and things they should avoid when they want to take a look at one of the airships in flight.

Marshall said pilots should not fly over or under a blimp because of its sensitivity to air currents. For example, in a downdraft a blimp can lose several hundred feet of altitude very quickly, posing a definite collision threat to which either pilot may not be able to react. Helicopters are of particular concern to Marshall and other blimp pilots. "The rotor wash can push us around," he said.

Two additional safety problems for non-LTA pilots come to mind. The first is speed. For example, an airplane pilot may want to pace one of the blimps and fly alongside it for a better look. But remember that blimp's cruise speed is slow, 35 to 40 MPH, and its cruising altitude is usually low, 1,000 to 3,000 feet AGL. If that sightseeing pilot is not proficient in slow-flight techniques or if he or she gets careless while looking at the blimp, the pilot runs the potential risk of stalling the airplane close to the ground without sufficient altitude to recover. Rather than experiencing a memorable flight to see a blimp, that pilot could become a classic stall/spin victim. To prevent such an accident, a pilot may want to make several passes from a safe distance to get a good look, remembering always to fly first and look second. Better yet, take a friend with a camera.

The other problem is misjudging the distance between the sightseeing aircraft and the blimp. Through this misjudgement a pilot could inadvertently fail to maintain a safe distance between the two aircraft. According to Marshall, part of the problem is the blimp's size and rarity. Most pilots have no experience in judging relative distance between their aircraft and a blimp. To show the size difference between two typical general aviation aircraft, a C-152 and a Learjet, and a blimp, see Figure 1. Why a business jet? As Marshall said, "Jet pilots like to look too." As you can see from the comparison the blimp is huge. What is a safe distance? A safe distance is one that complies with the FAR and provides a margin of error in case an unexpected event occurs, such as the blimp reacting to a vertical or horizontal wind shear.

The above advice is good for viewing one of the blimps en route to an event. But what about looking at one when it is being used as a camera platform over a sporting event or other large outdoor activity.

First, every pilot must review and comply with any NOTAM issued for the event. Normally if it is a major event there may be some kind of local flight restriction over the event. FAR § 91.137, Temporary flight restrictions, may apply. Pilots should also review FAR § 91.119, Minimum safe altitudes: General, to determine an appropriate altitude. Finally, after complying with any NOTAM issued for the event and applicable FAR, pilots flying near the event must still be very cautious. There may be other sightseeing aircraft over or near the site. One of the other pilots may not be as careful as you are, or they may not be aware the flight restrictions, if any, pertaining to the event. Inattention could cause a near mid-air or mid-air collision. There may also be banner-towing aircraft circling the site and their tow cables may or may not be very visible. Also the blimp will be maneuvering to stay over the site, and it has right of way under FAR § 91.113.

And finally, remember, if there is a blimp flying over an event, it probably is televising the event from the air. If so, its camera might be focused on you and your flying machine for all the world to see. So if you are going to be a TV star, be a safe one. And if the blimp is not the *Spirit of Akron*, it could be one of its sister ships, either the *Columbia* or the *America*, please give it safe passage. After all, we want to keep the flying spirit in general aviation. The *Spirit of Akron* that is.

Today, the *Spirit* and the rising popularity of hot air ballooning are breathing new life into one of man's earliest means of flight. Because of their uniqueness, each of us owes it to the pilots and crew of today's versions of those early forms of aircraft to provide each a wide berth and safe passage. ■

Photograph by Dean Chamberlain

Captain Marshall monitors the Spirit's electronic instrument panel in preparation for takeoff. The airship has three state-of-the-art CRT display screens on board.

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